UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/076,505	02/19/2002	Mark A. Kampe	80168-0106	5410

32658 7590 12/13/2005

HOGAN & HARTSON LLP
ONE TABOR CENTER, SUITE 1500
1200 SEVENTEEN ST.
DENVER, CO 80202

EXAMINER	
SHARON, AYAL I	

ART UNIT	PAPER NUMBER
2123	

DATE MAILED: 12/13/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	10/076,505	KAMPE, MARK A.	
	Examiner	Art Unit	
	Ayal I. Sharon	2123	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *19 February 2002*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-36* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-36* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *19 February 2002* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date *11/7/02*.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

DETAILED ACTION

Introduction

1. Claims 1-36 of U.S. Application 10/076,505, originally filed on 02/19/2002, have been presented for examination. This application is a continuation-in-part of U.S. Application 09/850,183, filed on 05/07/2001, which claims the benefit of provisional application 60/202,154, filed on 05/05/2000.
2. The instant application has been published as U.S. PG-PUB 2002/0077800 A1.

Claim Rejections - 35 USC § 101

3. 35 U.S.C. 101 reads as follows:

> Whoever invents or discovers any new and useful process, machine, manufacture, or composition of matter, or any new and useful improvement thereof, may obtain a patent therefor, subject to the conditions and requirements of this title.

4. An invention which is eligible for patenting under 35 U.S.C. § 101 is in the "useful arts" when it is a machine, manufacture, process or composition of matter, which produces a concrete, tangible, and useful result. The fundamental test for patent eligibility is thus to determine whether the claimed invention produces a "**useful, concrete and tangible result.**" The test for practical application as applied by the examiner involves the determination of the following factors:

    a. "**Useful**" - The Supreme Court in *Diamond v. Diehr* requires that the examiner look at the claimed invention as a whole and compare any asserted utility with the claimed invention to determine whether the

asserted utility is accomplished. Applying utility case law the examiner will note that:

I. the utility need not be expressly recited in the claims, rather it may be inferred.

II. if the utility is not asserted in the written description, then it must be well established.

b. "**Tangible**" - Applying *In re Warmerdam*, 33 F.3d 1354, 31 USPQ2d 1754 (Fed. Cir. 1994), the examiner will determine whether there is simply a mathematical construct claimed, such as a disembodied data structure and method of making it. If so, the claim involves no more than a manipulation of an abstract idea and therefore, is nonstatutory under 35 U.S.C. § 101. In *Warmerdam* the abstract idea of a data structure became capable of producing a useful result when it was fixed in a tangible medium which enabled its functionality to be realized. See MPEP §2106 (A). See also *Schrader*, 22 F.3d at 295, 30 USPQ2d at 1459.

c. "**Concrete**" - Another consideration is whether the invention produces a "concrete" result. Usually, this question arises when a result cannot be assured. An appropriate rejection under 35 U.S.C. § 101 should be accompanied by a lack of enablement rejection, because the invention cannot operate as intended without undue experimentation.

5. **Claims 1-15 and 31-35 are rejected under 35 U.S.C. 101 because the claimed invention is directed to non-statutory subject matter.** The claims,

as written, are directed to an abstract mathematical algorithm. The claimed invention is therefore not concrete or tangible. See MPEP §2106 (A), and *In re Warmerdam*, 33 F.3d 1354, 1360, 31 USPQ2d 1754, 1759 (Fed. Cir. 1994). See also *Schrader*, 22 F.3d at 295, 30 USPQ2d at 1459.

6. **Claims 16-30 are rejected under 35 U.S.C. 101 because the claimed invention is directed to non-statutory subject matter.** The claims, as written, are directed to software that is not tangibly embodied. The claimed invention is therefore not concrete or tangible. See MPEP §2106 (A), and *In re Warmerdam*, 33 F.3d 1354, 1360, 31 USPQ2d 1754, 1759 (Fed. Cir. 1994). See also *Schrader*, 22 F.3d at 295, 30 USPQ2d at 1459.

Claim Rejections - 35 USC § 112

7. **Claims 3, 18, and 33 rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the written description requirement.** The claim(s) contains subject matter which was not described in the specification in such a way as to reasonably convey to one skilled in the relevant art that the inventor(s), at the time the application was filed, had possession of the claimed invention.
8. Claims 3, 18, and 33 recite the limitation "component soft-restart". In the PG-PUB of the instant application, paragraphs [0034] and [0035] provide definitions for the expression "soft-reset", but not for "soft-restart". Paragraph [0041] refers to "attempt[ing] a soft-restart", but does not define it.

9. In the claim rejections that follow, Examiner has interpreted "soft-restart" as a typographical error for "soft-reset".

Claim Interpretations

10. Examiner interprets "warm-restart" as terminating an application and restarting it using saved information regarding the application. (See paragraph [0036] of the PG-PUB of the instant application).
11. Examiner interprets "cold-restart" as terminating an application and restarting it without any saved information regarding the application. (See paragraph [0037]).
12. Examiner interprets "soft-reset" as corresponding to either a "warm-restart" of an application, or a "warm-restart" of a sub-set of an application. (See paragraph [0035]).
13. Examiner interprets "fail-over" as corresponding to having all components on the affected node moved to a ready standby. (See paragraph [0038]).
14. Examiner interprets "repair rates" as corresponding to the frequencies of "warm-restart", "cold-restart", "soft-rest", "fail-over", etc.

Claim Rejections - 35 USC § 102

15. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

16. The prior art used for these rejections is as follows:

17. Mendiratta, V.B. "Reliability Analysis of Clustered Computing Systems." Proc. of the 9th Int'l Symposium on Software Reliability Engineering. Nov. 4-7, 1998. pp.682-272. ("**Mendriatta**").

18. The claim rejections are hereby summarized for Applicant's convenience. The detailed rejections follow.

19. Claims 1-5, 7, 9-20, 22 and 24-36 are rejected under 35 U.S.C. 102(b) as being anticipated by Mendriatta.

20. In regards to Claim 1, Mendriatta teaches the following limitations:

> 1.A method for modeling the availability of a cluster, the cluster having a plurality of software components and at least one node, the method comprising:

(See Mendriatta, especially: Section 4. "Reliability Model".)

> determining a plurality of component availability models using a repair model and a plurality of failure parameters, each of the plurality of component availability models corresponding to one of the plurality of software components;

(See Mendriatta, especially: Section 4. "Reliability Model".
The variable μ_R represents the processor repair rate.
The variables λ, $(1-c_a)$, $(1-c_1)$, $(1-c_2)$, $(1-c_3)$ are processor failure rates.)

> combining the plurality of component availability models;

(See Mendriatta, especially: Fig.2, "Cluster Failure Model".)

> determining repair rates for node and cluster reboots; and

(See Mendriatta, especially: Section 4. "Reliability Model".
The variable μ_R represents the processor repair rate, which is used to determine the cluster failure rate in Section 4.3, "Cluster Failure Model".)

> constructing an availability model based on the repair rates and

the combined plurality of component availability models.

(See Mendriatta, especially: Section 4.3, "Cluster Failure Model".)

21. In regards to Claim 2, Mendriatta teaches the following limitations:

> 2.The method of claim 1, wherein the repair model includes one or more repair modes.

(See Mendriatta, especially: Section 4. "Reliability Model".
The variables $(1-c_1)$ and $(1-c_2)$ are processor failure rates with restart recoveries and reload recoveries, respectively.)

22. In regards to Claim 3, Mendriatta teaches the following limitations:

> 3.The method of claim 2, wherein the one or more repair modes of the repair model include component soft-restart, component warm-restart, component cold-restart, component fail-over, node reboot; and cluster reboot.

(See Mendriatta, especially: Fig.2, "Cluster Failure Model".
The five non-working states shown in Fig.2 are:
(a) "switchover", which corresponds to the claimed "fail-over";
(b) "processor restart", which corresponds to the claimed "cold restart";
(c) "processor restart with reload", which corresponds to the claimed "warm restart" and "soft reset";
(d) "failed processor", which corresponds to the claimed "node reboot";
(e) "failed cluster", which corresponds to the claimed "cluster reboot".)

23. In regards to Claim 4, Mendriatta teaches the following limitations:

> 4.The method of claim 1, wherein the plurality of failure parameters include a failure rate, repair rate and efficacy.

(See Mendriatta, especially: Section 4. "Reliability Model".
The variables $(1-c_1)$ and $(1-c_2)$ are processor failure rates with restart recoveries and reload recoveries, respectively.
The variable μ_R represents the processor repair rate.
Efficacy is determined in Section 5., "Model Results".)

24. In regards to Claim 5, Mendriatta teaches the following limitations:

> 5.The method of claim 4, wherein the combining step further comprises:

obtaining aggregate failure rates, aggregate repair rates, and aggregate efficacies for the plurality of component availability models,

wherein the aggregate failure rates, the aggregate repair rates and the aggregate efficacies are obtained for each repair mode in the repair model.

(See Mendriatta, especially: Section 4. "Reliability Model".)

25. In regards to Claim 7, Mendriatta teaches the following limitations:

7. The method of claim 4, wherein the combining step further comprises:

for each repair mode in the repair model, aggregating failure rates of each of the plurality of software components;

for each repair mode in the repair model, aggregating repair rates of each of the plurality of software components; and

for each repair mode in the repair model, aggregating efficacies of each of the plurality of software components.

(See Mendriatta, especially: Section 4.1, "Processor Fault Types".)

26. In regards to Claim 9, Mendriatta teaches the following limitations:

9.The method of claim 1, wherein the determining the plurality of component availability models step further includes,

building an escalation graph for each of the plurality of software components.

(See Mendriatta, especially: Fig.2, "Cluster Failure Model".)

27. In regards to Claim 10, Mendriatta teaches the following limitations:

10.The method of claim 9, wherein the escalation graph for each software component includes a weighted directed graph with its nodes representing repair modes for the software component and its edges having transition rates.

(See Mendriatta, especially: Fig.2, "Cluster Failure Model".)

28. In regards to Claim 11, Mendriatta teaches the following limitations:

11.The method of claim 1, wherein the constructing step further comprises:

calculating a plurality of state-space parameters;

constructing a state-space model of the cluster; and
solving the state-space model.

(See Mendriatta, especially: Section 5, "Model Results".)

29. In regards to Claim 12, Mendriatta teaches the following limitations:

12.The method of claim 11, wherein the plurality of state-space parameters include aggregate failure rates, aggregate repair rates, aggregate efficacies, and the repair rates for node and cluster reboots, and
wherein an aggregate failure rate, an aggregate repair rate and an aggregate efficacy is assigned to each repair mode in the repair model.

(See Mendriatta, especially: Section 4.1, "Processor Fault Types".)

30. In regards to Claim 13, Mendriatta teaches the following limitations:

13.The method of claim 11, wherein the state-space model is represented as a weighted directed graph with its nodes representing states and its edges having transition rates.

(See Mendriatta, especially: Fig.2, "Cluster Failure Model".)

31. In regards to Claim 14, Mendriatta teaches the following limitations:

14.The method of claim 13, wherein the states are based on the repair model.

(See Mendriatta, especially: Section 4. "Reliability Model".)

32. In regards to Claim 15, Mendriatta teaches the following limitations:

15.The method of claim 1, wherein the plurality of component availability models include models for operation system software and models for non-operating system software.

(See Mendriatta, especially: Section 4. "Reliability Model".)

33. **Claims 16-20, 22, and 24-30 are rejected based on the same reasoning as claims 1-5, 7 and 9-15. Claims 16-20, 22, and 24-30 are system claims that**

recite limitations equivalent to those recited in method claims 1-5, 7 and 9-15 and taught throughout Mendriatta.

34. **Claims 31-34 are rejected on the same basis as claims 1, 9, 3, and 4, respectively. Both sets of claims are method claims.**

35. In regards to Claim 35, Mendriatta teaches the following limitations:

> 35.The method of claim 31, wherein the combining step further includes:
> for each repair mode in the repair model, aggregating values of each of the plurality of failure parameters.

(See Mendriatta, especially: Fig.2, "Cluster Failure Model".)

36. **Claim 36 is rejected based on the same reasoning as claim 1. Claim 36 is a tangible embodiment of method claim 1 and taught throughout Mendriatta.**

Conclusion

37. Claims 6, 8, 21, and 23 contain subject matter not taught by Mendriatta. These claims are rejected under 35 U.S.C. § 101, are therefore have not been indicated as objected to for depending on a rejected claim.

38. The following prior art, made of record and not relied upon, is considered pertinent to applicant's disclosure.

39. Wein, A.S. et al. "Validating Complex Computer System Availability Models." IEEE Transactions on Reliability. Oct. 1990. Vol.39, Issue 4, pp.468-479. (Figures 3 and 4 provide cluster failure models).

40. Nicola, V.F. et al. "Fast Simulation of Highly Dependable Systems with General Failure and Repair Processes." IEEE Transactions on Computers. Dec. 1993.

Vol.42, Issue 12, pp.1440-1452. (Fig.1 provides a diagram of the modeled cluster system.)

41. Johnson, A. et al. "Survey of Software Tools for Evaluating Reliability, Availability, and Serviceability." ACM Computing Surveys (CSUR). Dec. 1988. Vol.20, Issue 4, pp.227-269. (Provides a background into reliability modeling techniques).

42. Vaidyanathan, K. et al. "Analysis and Implementation of Software Rejuvenation in Cluster Systems." Proc. of the 2001 ACM SIGMETRICS Int'l Conf. 2001. pp.62-71. (Post-dates the priority filing date of the instant application. Fig.2 shows a cluster system model for repair / "rejuvenation".)

43. Cristian, F. "Understanding Fault-Tolerant Distributed Systems." Communications of the ACM. Feb. 1991. Vol.34, No.2, pp.57-78. (Pages 57-60 discuss failures of distributed systems).

44. Krishnan, R. "A Failure and Overload Tolerance Mechanism for Continuous Media Servers." Proc. of the 5th ACM Int'l Conf. on Multimedia. 1997. pp.131-142. (Sections 3.2 and 3.3 provide failure and recoverability models for clustered computer systems.)

45. U.S. Patent 6,438,705 to Chao et al. (Columns 3-5 teach all of the failure types discussed in the instant application.)

46. All cited Kampe patents and PG-PUBs were reviewed for possible double-patenting issues.

Correspondence Information

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Ayal I. Sharon whose telephone number is (571) 272-3714. The examiner can normally be reached on Monday through Thursday, and the first Friday of a bi-week, 8:30 am – 5:30 pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Leo Picard can be reached at (571) 272-3749.

Any response to this office action should be faxed to (571) 273-8300, or mailed to:

USPTO
P.O. Box 1450
Alexandria, VA 22313-1450

or hand carried to:

USPTO
Customer Service Window
Randolph Building
401 Dulany Street
Alexandria, VA 22314

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the Tech Center 2100 Receptionist, whose telephone number is (571) 272-2100.

Ayal I. Sharon
Art Unit 2123
December 2, 2005

Paul L. Rodriguez 12/6/05
Primary Examiner
Art Unit 2125